

- Agarwal, S., 115
Allam, M.A., 455
Armstrong, P., 183
Atkinson, W.A., 380
Ayachi, M., 106
Baier, R., 205, 208
Bensaada, A., 307
Bera, M., 582
Berends, R.W., 470
Betts, D.D., 89
Biemont, E., 470
Bissonnette, L.R., 39
Blanchet, V., 442
Braaten, E., 215
Brandt, F.T., 219
Brodie, D.E., 448
Brooks, R.L., 501
Carignan, C., 85
Carrington, M.E., 227
Chakrabarty, S., 488
Champagne, A., 410
Champagne, Y., 29
Chanda, A., 91
Changkakoti, R., 423
Choudhary, R.N.P., 322
Cossement, D., 462
Côté, C.-Y., 66
Couture, M., 70
Cova, P., 307
Coxon, J.A., 177
Currie, J.F., 307
Dagg, I.R., 91
Danailov, D.M., 578
Dancik, B.P., 181
Darewych, J.W., 365
De, S.S., 582
Delisle, C.A., 434
Denariez-Roberge, M.-M., 66, 442
Di Leo, L., 365
Dodelet, J.P., 462
Doizi, D., 59
Duguay, M.A., 85
Dunlap, R.A., 574
Egelstaff, P.A., 507
Ehlotzky, F., 340
Eichler, M., 186
El-Kashef, H., 25
Elias, V., 347
Essiambre, R.J., 11
Eu, B.C., 518
Evans, T.S., 241
Ezzat, M.A., 97
Flood, C.J., 1
Florjańczyk, M., 5
Fortin, E., 165
Frenkel, J., 219
Galarneau, P., 442
Gazeau, M.-C., 59
Ghosh, A.K., 582
Giuliani, G., 1
Govinda Raju, G.R., 571
Guay, D., 462
Guelton, N., 462
Guiasu, I., 360
Guo, Q.J.B., 470
Gush, H.P., 91
Hajigeorgiou, P.G., 177
Halder, J.C., 582
Han, Y., 434
Handoo, A.K., 155
Hannen, G.E.M., 586
Hardy, J.E., 152
Hazra, A.K., 582
Hazra, L.N., 434
Ho, W.C., 91
Holmes, J.K., 326
Huang, Z., 462
Hunt, J.L., 501
Hutt, D.L., 39
Jaraudias, J., 59
Jones, W.E., 142, 547
Kang, S.K., 398
Kapusta, J., 248
Khayat, R.E., 518
Killingbeck, J.P., 475
Kim, J.K., 398
Kobes, R., 252
Koniuk, R., 360
Kossanyi, J., 59
Kulac, I., 512
Kunstatter, G., 208, 252, 256
Lacoursière, R., 307
Lamm, D.R., 389
LaRochelle, S., 79
Lauzon, J., 79
Lawrie, I.D., 262
Le Floch, A.C., 175
Lejeune, C., 405
Lemelin, G., 417
Lépine, Y., 493
Lessard, R.A., 417, 423
Lit, J.W.Y., 20
Littmark, U., 578
Liu, J., 571
Liu, K.L., 351
Llewellyn, E.J., 552
Maciejko, R., 410
Mackie, M., 197
Mailhot, S., 429
Mak, G., 47
Mak, K., 252
Manivannan, G., 423
Margolis, B., 172
Masut, R.A., 307
McCarthy, N., 29, 429
McDade, I.C., 552
McKeon, D.G.C., 334
McLaurin, G., 507
Mielniczuk, W.J., 389
Miller, J.J., 501
Miteva, V., 578
Morrison, S.R., 147
Mysyrowicz, A., 165
Nakkagawa, H., 205, 269
Niégawa, A., 205, 269, 276
O'Neill, C., 442
Ord, G.N., 159
Osman, A., 455
Ouellette, F., 79, 85
Ozhassoglu, C., 162
Ozier, I., 91
Piché, M., 70
Pinnington, E.H., 128, 470
Pint, H., 512
Pire, B., 269
Pisarski, R.D., 280
Provencher, P., 66
Punch, S., 172
Rao, J.R., 115
Ray, P.K., 155
Razavy, M., 380
Reid, B., 410
Rustgi, M.L., 162
Saint-Jacques, R.G., 462
Salvetat, G., 59
Sassaroli, E., 168
Sati, R., 322

- Schiff, D., 208
Schönborn, O., 493
Sebak, A.R., 564
Shafai, L., 564
Sharma, S., 322
Sheng, Y., 405
Sherief, H.H., 97
Shivpuri, R.K., 316
Singh, N.L., 115
Smiiga, A.V., 295
Srivastava, Y.N., 168
Stark-Adamec, C., 191, 192
Szornel, K., 507
Takashiba, K., 276
Talon, M.-H., 85
Taylor, J.C., 219
Thoma, M.H., 285
Träbert, E., 128
Tran, C.A., 307
Tremblay, R., 5
Trepanier, F., 423
Ullrich, B., 512
Valat, P., 59
Vallee, R., 11
Valluri, S.R., 389
van Driel, H.M., 1, 47
van Eijck, M.A., 237
Van Hunen, J., 470
Varró, S., 340
Varshni, Y.P., 122
Verma, V.K., 316
Wallbank, B., 326
Wang, L., 142, 547
Wang, Z., 574
Weingartshofer, A., 326
Weldon, H.A., 300
Whalley, E., 507
Widom, A., 168
Wintgens, V., 59
Witwit, M.R.M., 133, 475
Wolf, C., 484
Wong, S.M.H., 219
Wu, Y.C., 403
Xu, J.R., 142, 547
Yang, X.H., 564
Yukalov, V.I., 537
Yukalova, E.P., 537
Zaky, M., 455
Zhang, J.-L., 20
Zhang, S., 448

0000	GENERAL	0480	Experimental tests of general relativity and observations of gravitational radiation
0100	COMMUNICATION, EDUCATION, HISTORY, AND PHILOSOPHY	0485	Intermediate range forces
0110	Announcements, news, and organizational activities	0490	Other topics in relativity and gravitation
0130	Physics literature and publications	0500	STATISTICAL PHYSICS AND THERMODYNAMICS
0130B	<i>Publications of lectures (advanced institutes, summer schools, etc.)</i>	0520	Statistical mechanics
0130C	<i>Conference proceedings</i>	0530	Quantum statistical mechanics
0130E	<i>Monographs, and collections</i>	0530L	<i>Anyons and parastatistics</i>
0130K	<i>Handbooks and dictionaries</i>	0540	Fluctuation phenomena, random processes, and Brownian motion
0130L	<i>Collections of physical data, tables</i>	0545	Theory and models of chaotic systems
0130N	<i>Textbooks</i>	0550	Lattice theory and statistics; Ising problems
0130Q	<i>Reports, dissertations, theses</i>	0560	Transport processes: theory
0130R	<i>Reviews and tutorial papers; resource letters</i>	0570	Thermodynamics
0130T	<i>Bibliographies</i>	0590	Other topics in statistical physics and thermodynamics
0140	Education	0600	MEASUREMENT SCIENCE, GENERAL
0150	Educational aids		LABORATORY TECHNIQUES, AND
0155	General Physics		INSTRUMENTATION SYSTEMS
0160	Biographical, historical, and personal notes	0620	Metrology
0165	History of science	0620D	<i>Measurement and error theory</i>
0170	Philosophy of science	0620F	<i>Units</i>
0175	Science and society	0620H	<i>Measurement standards and calibration</i>
0190	Other topics of general interest	0620J	<i>Determination of fundamental constants</i>
0200	MATHEMATICAL METHODS IN PHYSICS	0630	Measurement of basic variables
0210	Algebra, set theory, and graph theory	0630C	<i>Spatial variables measurement</i>
0220	Group theory	0630E	<i>Mass and density measurement</i>
0230	Function theory, analysis	0630F	<i>Time and frequency measurement</i>
0240	Geometry, differential geometry, and topology	0630G	<i>Velocity, acceleration and rotation measurement</i>
0250	Probability theory, stochastic processes, and statistics	0630L	<i>Measurement of basic electromagnetic variables</i>
0260	Numerical approximation and analysis	0630N	<i>Pressure measurement</i>
0270	Computational techniques	0650	Data handling and computation
0290	Other topics in mathematical methods in physics	0660	Laboratory techniques
0300	CLASSICAL AND QUANTUM PHYSICS; MECHANICS AND FIELDS	0670	General instrumentation
0320	Classical mechanics of discrete systems: general mathematical techniques	0690	Other topics in measurement science, general laboratory techniques and instrumentation systems
0330	Special relativity	0700	SPECIFIC INSTRUMENTATION AND TECHNIQUES OF GENERAL USE IN PHYSICS
0340	Classical mechanics of continuous media: general mathematical aspects	0710	Mechanical instruments and measurement methods
0340D	<i>Mathematical theory of elasticity</i>	0720	Thermal instruments and techniques
0340G	<i>Fluid dynamics: general mathematical aspects</i>	0720D	<i>Thermometry</i>
0340K	<i>Waves and wave propagation: general mathematical aspects</i>	0720F	<i>Calorimetry</i>
0350	Classical field theory	0720H	<i>Furnaces</i>
0365	Quantum theory; quantum mechanics	0720K	<i>High-temperature techniques and instrumentation; pyrometry</i>
0370	Theory of quantized fields	0720M	<i>Cryogenics</i>
0380	General theory of scattering	0725	Hygrometry
0400	RELATIVITY AND GRAVITATION	0730	Vacuum production and techniques
0420	General relativity	0730C	<i>Vacuum pumps and pumping techniques</i>
0430	Gravitational waves and radiation: theory	0730D	<i>Vacuum meters and measuring techniques</i>
0440	Continuous media; electromagnetic and other mixed gravitational systems	0735	High pressure production and techniques
0450	Unified field theories and other theories of gravitation	0750	Electrical instruments and techniques
0460	Quantum theory of gravitation	0755	Magnetic instruments and techniques
0465	Supergravity	0758	Magnetic resonance spectrometers, auxiliary instruments and techniques
		0760	Optical instruments and techniques
		0760D	<i>Photometry and radiometry</i>

- 0760F *Polarimetry and ellipsometry*
 0760H *Refractometry and reflectometry*
 0760L *Interferometry*
 0760P *Optical microscopy*
 0762 Detection of radiation (bolometers, photoelectric cells, i.r. and submillimetre waves detection)
 0765 Optical spectroscopy and spectrometers
 0765E *UV and visible spectroscopy and spectrometers*
 0765G *IR spectroscopy and spectrometers*
 0768 Photography, photographic instruments and techniques
 0775 Particle beam production and handling; targets
 0780 Electron and ion microscopes and techniques
 0785 X-ray, gamma-ray instruments and techniques
 0790 Other topics in specialised instrumentation
- 1000 **THE PHYSICS OF ELEMENTARY PARTICLES AND FIELDS**
- 1100 GENERAL THEORY OF FIELDS AND PARTICLES
 1110 Field theory
 1117 Theories of strings and other extended objects
 1120 S-matrix theory
 1130 Symmetry and conservation laws
 1140 Currents and their properties
 1150 Dispersion relations and sum rules
 1160 Complex angular momentum; Regge formalism
 1180 Relativistic scattering theory
 1190 Other topics in general field and particle theory
- 1200 SPECIFIC THEORIES AND INTERACTION MODELS: PARTICLE SYSTEMATICS
 1210 Unified field theories and models
 1220 Models of electromagnetic interaction
 1220D *Specific calculations and limits of quantum electrodynamics*
 1220F *Experimental tests of quantum electrodynamics*
 1225 Models for gravitational interactions
 1230 Models of weak interactions
 1235 Composite models of particles
 1235C *General properties of quantum chromodynamics (dynamics, confinement, etc.)*
 1235E *Applications of quantum chromodynamics to particle properties and reactions*
 1235H *Phenomenological composite models of particle structure and reactions (partons, bags, etc.)*
 1235K *Other composite models*
 1240 Models of strong interactions
 1240E *Statistical models*
 1240F *Bootstrap models*
 1240H *Duality and dual models*
 1240K *Hadron classification schemes*
 1240M *Complex angular momentum plane; Regge poles and cuts (Reggeons)*
 1240P *Absorptive, optical, and eikonal models*
 1240Q *Potential models*
 1240R *Peripheral models (one or more particle exchange)*
 1240S *Multiperipheral and multi-Regge models*
 1240V *Vector-meson dominance*
 1270 Hadron mass formulas
 1290 Miscellaneous theoretical ideas and models
- 1300 SPECIFIC REACTIONS AND PHENOMENOLOGY
 1310 Weak and electromagnetic interactions of leptons
 1315 Neutrino interactions
 1320 Leptonic and semileptonic decays of mesons
 1325 Hadronic decays of mesons
 1330 Decays of baryons
 1335 Decays of leptons
 1338 Decays of intermediate bosons
- 1340 Electromagnetic processes and properties
 1340D *Electromagnetic mass differences*
 1340F *Electromagnetic form factors; electric and magnetic moments; structure functions*
 1340H *Electromagnetic decays*
 1340K *Electromagnetic corrections to strong and weak interaction processes*
 1360 Photon and charged-lepton interactions with hadrons
 1360F *Elastic and Compton scattering*
 1360H *Total and inclusive cross sections*
 1360K *Meson production*
 1360M *Meson-resonance production*
 1360P *Baryon and baryon resonance production*
 1365 Hadron production by electron-positron collisions
 1375 Hadron-induced low- and intermediate-energy reactions and scattering, energy ≤ 10 GeV
 1375C *Nucleon-nucleon interactions, including antinucleon, deuteron, etc. (energy ≤ 10 GeV)*
 1375E *Hyperon-nucleon interactions (energy ≤ 10 GeV)*
 1375G *Pion-baryon interactions (energy ≤ 10 GeV)*
 1375J *Kaon-baryon interactions (energy ≤ 10 GeV)*
 1375L *Meson-meson interactions (energy ≤ 10 GeV)*
 1380 Photon-photon interactions and scattering
 1385 Hadron-induced high- and super-high-energy interactions, energy > 10 GeV
 1385D *Elastic scattering (energy > 10 GeV)*
 1385F *Inelastic scattering, two-particle final states (energy > 10 GeV)*
 1385H *Inelastic scattering, many-particle final state (energy > 10 GeV)*
 1385K *Inclusive reactions, including total cross sections, (energy > 10 GeV)*
 1385M *Cosmic ray interactions*
 1387 Jets in large- Q^2 interactions
 1388 Polarization in interactions and scattering
 1390 Other topics in specific reactions and phenomenology of elementary particles
- 1400 PROPERTIES OF SPECIFIC PARTICLES AND RESONANCES
 1420 Baryons and baryon resonances
 1440 Mesons and meson resonances
 1460 Leptons
 1480 Other and hypothetical particles
- 2000 **NUCLEAR PHYSICS**
- 2100 **NUCLEAR STRUCTURE**
 2110 General and average properties of nuclei; properties of nuclear energy levels
 2110D *Binding energy and masses*
 2110F *Shape, charge, radius, form factors and structure functions*
 2110H *Spin, parity, and isobaric spin*
 2110J *Spectroscopic factors*
 2110K *Electromagnetic moments*
 2110M *Level density and structure*
 2130 Nuclear forces
 2140 Few-nucleon systems
 2160 Nuclear-structure models and methods
 2160C *Shell model*
 2160E *Collective models*
 2160F *Models based on group theory*
 2160G *Cluster models*
 2160J *Hartree-Fock and random-phase approximations*
 2165 Nuclear matter
 2180 Hypernuclei
 2190 Other topics in nuclear structure

- 2300 RADIOACTIVITY AND ELECTROMAGNETIC TRANSITIONS
- 2320 Electromagnetic transitions
- 2320C *Lifetimes and transition probabilities*
- 2320N *Internal conversion and extranuclear affects*
- 2340 beta decay; electron and muon capture
- 2360 alpha decay
- 2380 Nuclear decays by heavy ion emission
- 2390 Other topics in nuclear decay and radioactivity
- 2400 NUCLEAR REACTIONS AND SCATTERING: GENERAL
- 2410 Nuclear reaction and scattering models and methods
- 2410H *Optical and diffraction models*
- 2430 Resonance reactions and scattering
- 2450 Direct reactions
- 2460 Statistical theory and fluctuations
- 2470 Polarization in reactions and scattering
- 2475 General properties of fission
- 2490 Other topics in nuclear reactions and scattering, general
- 2500 NUCLEAR REACTIONS AND SCATTERING: SPECIFIC REACTIONS
- 2510 Nuclear reactions and scattering involving few-nucleon systems
- 2520 Photonuclear reactions and photon scattering
- 2530 Lepton-induced reactions and scattering
- 2540 Nucleon-induced reactions and scattering
- 2550 ^2He - and ^3He -induced reactions and scattering
- 2560 ^3He - and ^4He -induced reactions and scattering
- 2570 Heavy ion induced reactions and scattering
- 2580 Meson- and hyperon-induced reactions and scattering
- 2585 Fission reactions
- 2588 Fusion reactions
- 2590 Other topics in nuclear reactions and scattering: specific reactions
- 2700 PROPERTIES OF SPECIFIC NUCLEI LISTED BY MASS RANGES
- 2710 $A \leq 5$
- 2720 $6 \leq A \leq 19$
- 2730 $20 \leq A \leq 38$
- 2740 $39 \leq A \leq 58$
- 2750 $59 \leq A \leq 89$
- 2760 $90 \leq A \leq 149$
- 2770 $150 \leq A \leq 189$
- 2780 $190 \leq A \leq 219$
- 2790 $220 \leq A$
- 2800 NUCLEAR ENGINEERING AND NUCLEAR POWER STUDIES
- 2820 Neutron physics
- 2841 Fission reactor theory and design
- 2842 Fission reactor materials
- 2842H *Fuel preparation and reprocessing*
- 2843 Fission reactor operation
- 2844 Fission reactor protection system, safety and accidents
- 2846 Nuclear materials: safety aspects
- 2846C *Safeguards*
- 2846E *Criticality safety*
- 2846G *Packaging and transportation*
- 2847 Fission reactor decommissioning
- 2850 Fission reactor types and applications
- 2852 Fusion reactors
- 2858 Integrated reactor systems
- 2870 Nuclear explosions
- 2875 Radioactive waste, transportation, disposal, storage, treatment
- 2880 Radiation technology, including shielding
- 2890 Other topics in nuclear engineering and nuclear power studies
- 2900 EXPERIMENTAL METHODS AND INSTRUMENTATION FOR ELEMENTARY-PARTICLE AND NUCLEAR PHYSICS
- 2910 Preacceleration (injection)
- 2915 Electrostatic and linear particle accelerators
- 2920 Cyclic accelerators and storage facilities
- 2925 Particle sources and targets, preparation and technology
- 2930 Radiation spectrometers and spectroscopic techniques
- 2940 Radiation detectors
- 2940W *Solid-state nuclear track detectors*
- 2960 Counting circuits and nuclear electronics
- 2970 Radiation measurement, detection and counting
- 2975 Polarization analysis
- 2980 Nuclear information processing
- 2990 Other topics in high-energy and nuclear experimental methods and instrumentation
- 3000 ATOMIC AND MOLECULAR PHYSICS
- 3100 THEORY OF ATOMS AND MOLECULES
- 3110 General theory of structure, transitions and chemical binding
- 3115 General mathematical and computational developments
- 3120 Specific calculations and results
- 3120D *Complete ab initio calculations (exact or nearly exact calculations on small species)*
- 3120E *Ab initio LCAO and COSCF calculations*
- 3120G *Other accurate or nearly ab initio calculations*
- 3120H *Xalpha methods*
- 3120J *Local density approximation*
- 3120L *Other statistical model calculations (Thomas-Fermi and Thomas-Fermi-Dirac models)*
- 3120N *Semi-empirical NDO calculations (CNDO, INDO, MINDO, PCILO methods, etc.)*
- 3120P *Other semi-empirical calculations (Hückel, generalized Hückel, PPP methods, etc.)*
- 3120R *Valence bond calculations (ab initio or not)*
- 3120T *Electron correlations and CI calculations*
- 3120W *Empirical methods (nonquantum methods for conformations)*
- 3130 Electronic structure, corrections and effects of interactions
- 3130G *Hyperfine interactions and isotope effects*
- 3130J *Radiative and relativistic effects*
- 3130L *Environmental and solvent effects*
- 3130N *Molecular solids*
- 3150 Excited states
- 3190 Other topics in the theory of atoms and molecules
- 3200 ATOMIC SPECTRA AND INTERACTIONS WITH PHOTONS
- 3220 Atomic spectra grouped by wavelength ranges
- 3220D *Radiofrequency and microwave spectra*
- 3220F *Infrared and Raman spectra*
- 3220J *Visible and ultraviolet spectra*
- 3220R *X-ray spectra*
- 3240 Magnetic resonance spectra
- 3250 Fluorescence, phosphorescence; radiationless transitions
- 3250F *Fluorescence, phosphorescence*
- 3250H *Radiationless transitions*
- 3260 Magneto-optical and electro-optical spectra
- 3260S *Stark effect*
- 3260V *Zeeman effect*
- 3270 Spectral line shapes and intensities
- 3280 Photon interactions with atoms

- 3280B *Level crossing, optical pumping, population inversion, stimulated emission*
- 3280D *Autoionization*
- 3280F *Photoionization, photodetachment, photoelectron spectra*
- 3280H *Auger effect and inner-shell ionization*
- 3280K *Multiphoton processes*
- 3280P *Optical cooling of atoms; trapping*
- 3290 Other topics in atomic spectra and interactions with photons
- 3300 MOLECULAR SPECTRA AND INTERACTIONS WITH PHOTONS
- 3310 Calculation of molecular spectra
- 3320 Molecular spectra grouped by wavelength ranges
- 3320B *Radiofrequency and microwave spectra*
- 3320E *Infrared spectra*
- 3320F *Raman and Rayleigh spectra*
- 3320K *Visible spectra*
- 3320L *Ultraviolet spectra*
- 3320N *Vacuum ultraviolet spectra*
- 3320R *X-ray spectra*
- 3325 Nuclear magnetic resonance and relaxation; nuclear quadrupole resonance (NQR)
- 3330 Electron paramagnetic resonance and relaxation
- 3335 Double resonances and other multiple resonances
- 3335H *MODR and PMDR (microwave optical double resonance and phosphorescence microwave double resonance)*
- 3340 Mössbauer spectra
- 3345 Magneto-optical and electro-optical effects; birefringence, dichroism and optical activity
- 3345B *Zeeman and Stark effects*
- 3345C *Magnetic circular dichroism*
- 3350 Fluorescence, phosphorescence; radiationless transitions (intersystem crossing, internal conversion)
- 3350D *Fluorescence and phosphorescence spectra*
- 3350H *Radiationless transitions*
- 3365 Photoelectron spectra
- 3370 Intensities and shapes of molecular spectral lines and bands
- 3380 Photon interactions with molecules
- 3380B *Level crossing, optical pumping, population inversion, stimulated emission*
- 3380E *Autoionization, photoionization, and photodetachment*
- 3380G *Diffuse spectra; predissociation, photodissociation*
- 3380K *Multiphoton processes*
- 3380P *Optical cooling of molecules; trapping*
- 3390 Other topics in molecular spectra and interactions with photons
- 3400 ATOMIC AND MOLECULAR COLLISION PROCESSES AND INTERACTIONS
- 3410 General theories and models
- 3420 Interatomic and intermolecular potentials and forces
- 3425 Intramolecular energy transfer; intramolecular dynamics; dynamics of van der Waals molecules
- 3430 Potential energy surfaces for collisions
- 3440 Elastic scattering of atoms and molecules
- 3450 Inelastic scattering of atoms and molecules
- 3450E *Rotational and vibrational energy transfer*
- 3450H *Electronic excitation and ionization (inc. beam-foil excitation and ionization)*
- 3450L *Chemical reactions, energy disposal, and angular distribution, as studied by atomic and molecular beams*
- 3450R *Laser-modified scattering*
- 3470 Charge transfer
- 3480 Electron scattering, electron spectra
- 3480B *Elastic scattering of electrons by atoms and molecules*
- 3480D *Atomic excitation and ionization by electron impact*
- 3480G *Molecular excitation, ionization, and dissociation by electron impact*
- 3480Q *Laser-modified scattering*
- 3490 Other topics in atomic and molecular collision processes and interactions
- 3500 PROPERTIES OF ATOMS AND MOLECULES; INSTRUMENTS AND TECHNIQUES
- 3510 Atoms
- 3510B *Atomic masses, mass spectra, abundances, and isotopes*
- 3510D *Electric and magnetic moments, polarizability*
- 3510F *Fine- and hyperfine-structure constants*
- 3510H *Ionization potentials, electron affinities*
- 3510W *Weak interactions*
- 3520 Molecules
- 3520B *General molecular conformation and symmetry; stereochemistry*
- 3520D *Interatomic distances and angles*
- 3520G *Bond strengths, dissociation energies, hydrogen bonding*
- 3520J *Barrier heights (internal rotation, inversion); rotational isomerism, conformational dynamics*
- 3520M *Electric and magnetic moments (and derivatives), polarizability, and magnetic susceptibility*
- 3520P *Rotation, vibration, and vibration-rotation constants*
- 3520S *Hyperfine and fine-structure constants*
- 3520V *Ionization potentials, electron affinities, molecular core binding energy*
- 3520W *Weak interactions*
- 3520X *Mass spectra*
- 3520Y *Correlation times in molecular dynamics*
- 3580 Atomic and molecular measurements and techniques
- 3580B *Time-resolved measurements and techniques*
- 3600 STUDIES OF SPECIAL ATOMS AND MOLECULES
- 3610 Exotic atoms and molecules (containing mesons, muons, and other abnormal particles)
- 3620 Macromolecules and polymer molecules
- 3640 Atomic and molecular clusters
- 3690 Other special atoms and molecules
- 4000 CLASSICAL AREAS OF PHENOMENOLOGY
- 4100 ELECTRICITY AND MAGNETISM; FIELDS AND CHARGED PARTICLES
- 4110 Classical electromagnetism
- 4110D *Electrostatics, magnetostatics*
- 4110F *Steady-state electromagnetic fields; electromagnetic induction*
- 4110H *Electromagnetic waves: theory*
- 4170 Particles in electromagnetic fields
- 4180 Particle beams and particle optics
- 4180D *Electron beams and electron optics*
- 4180G *Ion beams and ion optics*
- 4190 Other topics in electricity and magnetism
- 4200 OPTICS
- 4210 Propagation and transmission in homogeneous media
- 4220 Propagation and transmission in inhomogeneous media
- 4230 Optical information, image formation and analysis
- 4240 Holography
- 4250 Quantum optics
- 4252 Masers
- 4255 Lasing processes
- 4255B *General theory of lasing action*
- 4255D *CO₂ lasers*
- 4255F *Inert gas lasers*
- 4255G *Excimer lasers*
- 4255H *Lasing action in other gas lasers*

- 4255K *Chemical lasers*
 4255M *Lasing action in liquids and organic dyes*
 4255N *Fibre lasers and amplifiers*
 4255P *Lasing action in semiconductors with junctions*
 4255Q *Laser-active defect centres in solids*
 4255R *Lasing action in other solids*
 4255T *Free electron lasers*
 4255V *High energy lasing processes (e.g. gamma and X-ray lasers)*
 4260 *Laser systems and laser beam applications*
 4260B *Design of specific laser systems*
 4260D *Laser resonators and cavities*
 4260F *Laser beam modulation, pulsing and switching; mode locking and tuning*
 4260H *Laser beam characteristics and interactions*
 4260K *Laser beam applications*
 4265 *Nonlinear optics*
 4265C *Stimulated Raman scattering and spectra; CARS; stimulated Brillouin and stimulated Rayleigh scattering and spectra*
 4265F *Phase conjugation*
 4265G *Optical transient phenomena, self-induced transparency, optical saturation and related effects*
 4265J *Beam trapping, self focusing, thermal blooming, and related effects*
 4265K *Harmonic generation, frequency conversion, parametric oscillation and amplification*
 4265M *Multiwave mixing*
 4265P *Optical bistability, multistability and switching*
 4270 *Optical materials*
 4270C *Glass*
 4270G *Light-sensitive materials*
 4272 *Optical sources and standards*
 4278 *Optical lens and mirror systems*
 4278H *Coatings*
 4280 *Optical devices, techniques and applications*
 4280B *Spatial filters, zone plates*
 4280C *Spectral and other filters*
 4280D *Monochromators*
 4280E *Shutters, windows, diaphragms, deflectors, choppers, and optical scanners*
 4280F *Gratings, echelles*
 4280K *Optical beam modulators*
 4280L *Optical wave guides and couplers*
 4280Q *Image detectors, convertors, and intensifiers*
 4280R *Gradient-index (GRIN) devices*
 4280S *Optical communications devices*
 4280W *Ultrafast optical techniques*
 4281 *Fibre optics and fibre wave guides*
 4281B *Fibre fabrication, cladding, splicing, joining*
 4281C *Fibre testing and measurement of fibre parameters*
 4281H *Gradient-index (GRIN) fibre devices and techniques*
 4281M *Fibre couplers and connectors*
 4281P *Fibre optic sensors; fibre gyros*
 4281W *Other fibre optical devices and techniques*
 4282 *Integrated optics*
 4285 *Optical testing and workshop techniques*
 4290 *Other topics in optics*
 4300 **ACOUSTICS**
 4320 *General linear acoustics*
 4325 *Nonlinear acoustics and macrosonics*
 4328 *Aeroacoustics and atmospheric sound*
 4330 *Underwater sound*
 4335 *Ultrasonics, quantum acoustics, and physical effects of sound*
 4340 *Structural acoustics and vibration*
 4345 *Statistical studies of acoustical response*
 4350 *Noise, its effects and control*
 4355 *Architectural acoustics*
 4360 *Acoustic signal processing*
 4363 *Acoustic holography*
 4370 *Speech communication*
 4375 *Music and musical instruments*
 4385 *Acoustical measurements and instrumentation*
 4388 *Transduction; devices for the generation and reproduction of sound*
 4390 *Other topics in acoustics*
 4400 **HEAT FLOW, THERMAL AND THERMODYNAMIC PROCESSES**
 4410 *Heat conduction (models, phenomenological description)*
 4425 *Convection*
 4430 *Heat transfer in inhomogeneous media and through interfaces*
 4440 *Heat radiation*
 4450 *Thermal properties of matter (phenomenology)*
 4460 *Thermodynamic processes (phenomenology)*
 4490 *Other topics in heat flow, thermal and thermodynamic processes*
 4600 **MECHANICS, ELASTICITY, RHEOLOGY**
 4610 *Mechanics of discrete systems*
 4620 *Continuum mechanics*
 4630 *Mechanics of solids*
 4630C *Elasticity*
 4630J *Viscoelasticity, plasticity, viscoplasticity, creep, and stress relaxation*
 4630L *Buckling and instability*
 4630M *Vibrations, aeroelasticity, hydroelasticity, mechanical waves, and shocks*
 4630N *Fracture mechanics, fatigue, and cracks*
 4630P *Friction, wear, adherence, hardness, mechanical contacts*
 4630R *Measurement methods and techniques*
 4660 *Rheology of fluids and pastes*
 4690 *Other topics in mechanics, elasticity, and rheology*
 4700 **FLUID DYNAMICS**
 4710 *General theory, simulation and other computational methods*
 4715 *Laminar flows*
 4715C *Laminar boundary layers*
 4715F *Stability of laminar flows*
 4720 *Hydrodynamic stability and instability*
 4725 *Turbulent flows, convection, and heat transfer*
 4725C *Isotropic turbulence*
 4725F *Boundary layer and shear turbulence*
 4725J *Turbulent diffusion*
 4725M *Noise (turbulence generated)*
 4725Q *Convection and heat transfer*
 4725R *Wakes*
 4730 *Rotational flow, vortices, buoyancy and other flows involving body forces*
 4735 *Waves*
 4740 *Compressible flows; shock and detonation phenomena*
 4740D *General subsonic flows*
 4740H *Transonic flows*
 4740K *Supersonic and hypersonic flows*
 4740N *Shock-wave interactions*
 4745 *Rarefied gas dynamics*
 4750 *Non-Newtonian dynamics*
 4755 *Nonhomogeneous flows*
 4755B *Cavitation*
 4755C *Jets*
 4755E *Nozzles*
 4755H *Stratified flows*
 4755K *Multiphase flows*
 4755M *Flow through porous media*

- 4760 Flows in ducts, channels, and conduits
 4765 Magnetohydrodynamics and electrohydrodynamics
 4770 Reactive, radiative, or nonequilibrium flows
 4775 Relativistic fluid dynamics
 4780 Instrumentation for fluid dynamics
 4790 Other topics in fluid dynamics
- 5000 **FLUIDS, PLASMAS AND ELECTRIC DISCHARGES**
- 5100 **KINETIC AND TRANSPORT THEORY OF FLUIDS; PHYSICAL PROPERTIES OF GASES**
 5110 Kinetic and transport theory
 5120 Viscosity and diffusion: experimental
 5130 Thermal properties of gases
 5140 Acoustical properties of gases; ultrasonic relaxation
 5150 Electrical phenomena in gases
 5160 Magnetic phenomena in gases
 5170 Optical phenomena in gases
 5190 Other topics in the physics of fluids
- 5200 **THE PHYSICS OF PLASMAS AND ELECTRIC DISCHARGES**
 5220 Elementary processes in plasma
 5220F *Electron collisions*
 5220H *Atomic, molecular, ion and heavy particle collisions*
 5225 Plasma properties
 5225F *Transport properties*
 5225P *Emission, absorption, and scattering of radiation*
 5230 Plasma flow; magnetohydrodynamics
 5235 Waves, oscillations, and instabilities in plasma
 5235R *Plasma turbulence*
 5235T *Shock-waves*
 5240 Plasma interactions
 5240D *Electromagnetic wave propagation in plasma*
 5240F *Antennas in plasma; plasma-filled wave guides*
 5240H *Solid-state plasma interaction*
 5240K *Sheaths*
 5240M *Particle beam interactions in plasma*
 5250 Plasma production and heating
 5250J *Plasma production and heating by laser beams*
 5250L *Plasma production and heating by shock waves and compression*
 5255 Plasma equilibrium and confinement
 5260 Relativistic plasma
 5265 Plasma simulation
 5270 Plasma diagnostic techniques and instrumentation
 5275 Plasma devices and applications
 5280 Electric discharges
 5290 Other topics in plasma physics and electric discharges
- 6000 **CONDENSED MATTER: STRUCTURE, THERMAL AND MECHANICAL PROPERTIES**
- 6100 **STRUCTURE OF LIQUIDS AND SOLIDS; CRYSTALLOGRAPHY**
 6110 X-ray determination of structures
 6110D *Theories of diffraction and scattering*
 6110F *Experimental diffraction and scattering techniques*
 6110M *Crystal structure solution and refinement techniques*
 6112 Neutron determination of structures
 6112B *Theories of diffraction and scattering*
 6112E *Neutron scattering techniques*
 6112G *Neutron diffraction techniques*
 6114 Electron determination of structures
 6114D *Theories of diffraction and scattering*
 6114F *Experimental diffraction and scattering*
 6114H *Low-energy electron diffraction (LEED) and reflection high-energy electron diffraction (RHEED)*
 6114R *Other electron diffraction and scattering techniques*
- 6116 Other determination of structures
 6116D *Electron microscopy determinations*
 6116F *Field-ion microscopy determinations; atom and ion scattering techniques*
 6116N *EPR and NMR determinations*
 6116P *Scanning tunnelling microscopy and related techniques*
 6120 Classical, semiclassical, and quantum theories of liquid structure
 6125 Studies of specific liquid structures
 6125M *Liquid metals and liquid alloys*
 6130 Liquid crystals
 6140 Amorphous and polymeric materials
 6140D *Glasses*
 6140K *Polymers, elastomers, and plastics*
 6140M *Quasicrystals*
 6150 Crystalline state
 6150C *Physics of crystal growth*
 6150E *Crystal symmetry; models and space groups, and crystalline systems and classes*
 6150J *Crystal morphology and orientation*
 6150K *Crystallographic aspects of polymorphic and order-disorder transformations*
 6150L *Crystal binding*
 6155 Specific structure of elements and alloys
 6155D *Nonmetallic elements*
 6155F *Metallic elements*
 6155H *Alloys*
 6160 Specific structure of inorganic compounds
 6165 Specific structure of organic compounds
 6170 Defects in crystals
 6170A *Annealing processes*
 6170B *Interstitials and vacancies*
 6170D *Colour centres*
 6170E *Other point defects*
 6170G *Dislocations: theory*
 6170J *Etch pits, decoration, transmission electron microscopy and other direct observations of dislocations*
 6170L *Slip, creep, internal friction and other indirect evidence of dislocations*
 6170N *Grain and twin boundaries*
 6170P *Stacking faults, stacking fault tetrahedra and other planar or extended defects*
 6170Q *Inclusions and voids*
 6170R *Crystal impurities: general*
 6170T *Doping and implantation of impurities*
 6170W *Impurity concentration, distribution, and gradients*
 6170Y *Interaction between different crystal structure defects*
 6180 Radiation damage and other irradiation effects
 6180B *Ultraviolet, visible and infrared radiation*
 6180C *X-rays*
 6180E *Gamma rays*
 6180F *Electrons and positrons*
 6180H *Neutrons*
 6180J *Ions*
 6180L *Atoms and molecules*
 6180M *Channelling, blocking and energy loss of particles*
 6190 Other topics in structure of liquids and solids
- 6200 **MECHANICAL AND ACOUSTIC PROPERTIES OF CONDENSED MATTER**
 6210 Mechanical properties of liquids
 6220 Mechanical properties of solids (related to microscopic structure)
 6220D *Elasticity, elastic constants*
 6220F *Deformation and plasticity*
 6220H *Creep*
 6220M *Fatigue, brittleness, fracture, and cracks*
 6220P *Tribology*
 6230 Mechanical and elastic waves

- 6240 Anelasticity, internal friction and mechanical resonances
 6250 High-pressure and shock-wave effects in solids
 6260 Acoustic properties of liquids
 6265 Acoustic properties of solids
 6280 Ultrasonic relaxation
 6290 Other topics in mechanical and acoustical properties of condensed matter
- 6300 LATTICE DYNAMICS AND CRYSTAL STATISTICS
 6310 General theory
 6320 Phonons and vibrations in crystal lattices
 6320D *Phonon states and bands, normal modes, and phonon dispersion*
 6320H *Phonon-phonon interactions*
 6320K *Phonon-electron interactions*
 6320L *Phonon interactions with quasi-particles*
 6320M *Phonon-defect interactions*
 6320P *Localized modes*
 6320R *Anharmonic lattice modes*
 6350 Vibrational states in disordered systems
 6370 Statistical mechanics of lattice vibrations
 6375 Statistical mechanics of displacive phase-transitions
 6390 Other topics in lattice dynamics and crystal statistics
- 6400 EQUATIONS OF STATE, PHASE EQUILIBRIA, AND PHASE TRANSITIONS
 6410 General theory of equations of state and phase equilibria
 6430 Equations of state of specific substances
 6460 General studies of phase transitions
 6470 Phase equilibria, phase transitions, and critical points
 6470D *Solid-liquid transitions*
 6470F *Liquid-vapour transitions*
 6470H *Solid-vapour transitions*
 6470J *Liquid-liquid transitions*
 6470K *Solid-solid transitions*
 6470M *Transitions in liquid crystals*
 6470P *Glass transitions*
 6470R *Commensurate-incommensurate transitions*
 6475 Solubility, segregation, and mixing
 6480 Other phase properties of systems
 6490 Other topics in equations of state, phase equilibria, and phase transitions
- 6500 THERMAL PROPERTIES OF CONDENSED MATTER
 6520 Heat capacities of liquids
 6540 Heat capacities of solids
 6550 Thermodynamic properties and entropy
 6570 Thermal expansion and thermomechanical effect
 6590 Other topics in thermal properties of condensed matter
- 6600 TRANSPORT PROPERTIES OF CONDENSED MATTER (NONELECTRONIC)
 6610 Diffusion and ionic conduction in liquids
 6620 Diffusive momentum transport
 6630 Diffusion in solids
 6630D *Theory of diffusion and ionic conduction in solids*
 6630F *Self-diffusion in metals, semimetals, and alloys*
 6630H *Self-diffusion and ionic conduction in nonmetals*
 6630J *Diffusion, migration, and displacement of impurities*
 6630L *Diffusion, migration and displacement of other defects*
 6630N *Chemical interdiffusion*
 6630Q *Electromigration*
 6660 Thermal conduction in nonmetallic liquids
 6670 Nonelectronic thermal conduction and heat-pulse propagation in nonmetallic solids
 6690 Other topics in nonelectronic transport properties
- 6700 QUANTUM FLUIDS AND SOLIDS; LIQUID AND SOLID HELIUM
 6720 Quantum effects on the structure and dynamics of nondegenerate fluids
 6740 Boson degeneracy and superfluidity of helium-4
 6750 Fermi fluids; liquid helium-3
 6760 Mixed systems; liquid helium 3-4 mixtures
 6765 Spin-polarized hydrogen and helium
 6770 Films
 6780 Solid helium and related quantum crystals
 6790 Other topics in quantum fluids and solids (e.g. neutron-star matter)
- 6800 SURFACES AND INTERFACES; THIN FILMS AND WHISKERS
 6810 Fluid surfaces and interfaces with fluids
 6815 Liquid thin films
 6817 Monolayers and Langmuir-Blodgett films
 6820 Solid surface structure
 6822 Surface diffusion, segregation and interfacial compound formation
 6825 Mechanical and acoustical properties of solid surfaces and interfaces
 6830 Dynamics of solid surfaces and interface vibrations
 6840 Surface energy of solids; thermodynamic properties
 6842 Surface phase transitions and critical phenomena
 6845 Solid-fluid interface processes
 6848 Solid-solid interfaces
 6855 Thin film growth, structure, and epitaxy
 6860 Physical properties of thin films, nonelectronic
 6865 Layer structures, intercalation compounds and superlattices: growth, structure and nonelectronic properties
 6870 Whiskers and dendrites: growth, structure, and nonelectronic properties
 6890 Other topics in the structure and nonelectronic properties of surfaces and thin films
- 7000 CONDENSED MATTER: ELECTRONIC STRUCTURE, ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES
 7100 ELECTRON STATES
 7110 General theories and computational techniques
 7120 Electronic density of states determinations
 7125 Nonlocalized single-particle electronic states
 7125C *Techniques of band-structure calculation (general theory, applications of group theory, analytic continuation, etc.)*
 7125H *Measurement of Fermi surface parameters*
 7125J *Effective mass and g-factors*
 7125L *Electron energy states in liquid metals*
 7125M *Electron energy states in amorphous and glassy solids*
 7125P *Band structure of crystalline metals*
 7125R *Band structure of crystalline elemental semiconductors*
 7125T *Band structure of crystalline semiconductor compounds and insulators*
 7128 Narrow-band systems, heavy-fermion metals; intermediate-valence solids
 7130 Metal-insulator transitions
 7135 Excitons and related phenomena
 7136 Polaritons
 7138 Polarons and electron-phonon interactions
 7145 Collective effects
 7145G *Exchange, correlation, dielectric and magnetic functions, plasmons*
 7145J *Fermi-Thomas model*
 7145L *Charge-density-wave systems*
 7145N *Calculations of total electronic binding energy*
 7150 Localized single-particle electronic states
 7155 Impurity and defect levels

- 7155J *Localization in disordered structures*
 7165 Positron states
 7170 Level splitting and interactions
 7170C *Crystal and ligand fields*
 7170E *Spin-orbit coupling, Zeeman, Stark and strain splitting*
 7170G *Exchange interactions*
 7170J *Nuclear states and interactions*
 7170M *Other bulk localized states*
 7190 Other topics in electron states
- 7200 ELECTRONIC TRANSPORT IN CONDENSED MATTER
 7210 Theory of electronic transport; scattering mechanisms
 7215 Electronic conduction in metals and alloys
 7215C *Electrical and thermal conduction in amorphous and liquid metals and alloys*
 7215E *Electrical and thermal conduction in crystalline metals and alloys*
 7215G *Galvanomagnetic and other magnetotransport effects*
 7215H *Thermomagnetic effects*
 7215J *Thermoelectric effects*
 7215L *Relaxation times and mean free paths*
 7215N *Collective modes; low-dimensional conductors*
 7215Q *Scattering mechanisms and Kondo effect*
 7215R *Quantum localization*
 7220 Conductivity phenomena in semiconductors and insulators
 7220D *General theory, scattering mechanisms*
 7220F *Low-field transport and mobility; piezoresistance*
 7220H *High-field and nonlinear effects*
 7220J *Charge carriers: generation, recombination, lifetime, and trapping*
 7220M *Galvanomagnetic and other magnetotransport effects*
 7220N *Thermomagnetic effects*
 7220P *Thermoelectric effects*
 7230 High-frequency effects; plasma effects
 7240 Photoconduction and photovoltaic effects; photodielectric effects
 7250 Acoustoelectric effects
 7255 Magnetoacoustic effects
 7260 Mixed conductivity and conductivity transitions
 7270 Noise processes and phenomena
 7280 Conductivity of specific semiconductors and insulators
 7280C *Elemental semiconductors*
 7280E *III-V and II-VI semiconductors*
 7280G *Transition-metal compounds*
 7280J *Other crystalline inorganic semiconductors*
 7280L *Organic semiconductors*
 7280N *Amorphous and glassy semiconductors*
 7280P *Liquid semiconductors*
 7290 Other topics in electronic transport in condensed matter
- 7300 ELECTRONIC STRUCTURE AND ELECTRICAL PROPERTIES OF SURFACES, INTERFACES, AND THIN FILMS
 7320 Electronic surface states
 7325 Surface conductivity and carrier phenomena
 7330 Surface double layers, Schottky barriers, and work functions
 7335 Mesoscopic systems
 7340 Interfaces
 7340B *Static electrification*
 7340G *Tunnelling: general*
 7340J *Metal-to-metal contacts*
 7340L *Semiconductor-to-semiconductor contacts, p-n junctions and heterojunctions*
 7340M *Semiconductor-electrolyte contacts*
 7340N *Metal-nonmetal contacts*
 7340Q *Metal-insulator-semiconductor structures*
 7340R *Metal-insulator-metal structures*
 7340S *Semiconductor-insulator-semiconductor structures*
 7340T *Semiconductor-metal-semiconductor structures*
 7360 Electronic properties of thin films
 7360D *Metallic thin films*
 7360F *Semiconductor films*
 7360H *Insulating thin films*
 7390 Other topics in electrical properties of surfaces, interfaces, and thin films
- 7400 SUPERCONDUCTIVITY
 7410 Occurrence, critical temperature
 7420 Theory
 7420F *BCS theory and its applications*
 7430 General properties
 7430C *Magnetization curves, Meissner effect, penetration depth*
 7430E *Thermodynamic properties; thermal conductivity*
 7430G *Response to electromagnetic fields, nuclear magnetic resonance, ultrasonic attenuation*
 7440 Fluctuations and critical effects
 7450 Proximity effect, tunnelling phenomena, and Josephson effect
 7455 Type-I superconductivity
 7460 Type-II superconductivity
 7460E *Mixed state, H_{c2} , surface sheath*
 7460G *Flux pinning, flux motion, fluxon-defect interactions*
 7460J *Critical currents*
 7460M *Material effects on T_c , K , critical currents*
 7465 Insulator-superconductor transition
 7470 Superconducting materials
 7470B *Elemental superconductors*
 7470C *Al compounds and alloys*
 7470E *Interstitial compounds and alloys*
 7470F *Chevre phase (ternary molybdenum chalcogenide) superconductors*
 7470H *Magnetic superconductors*
 7470J *Superconducting layer structures and intercalation compounds*
 7470K *Organic superconductors*
 7470M *Amorphous, highly disordered, and granular superconductors*
 7470Q *Laves phase (C15) superconductors*
 7470S *Superconducting metastable nonstoichiometric phases*
 7470T *Heavy-fermion superconductors*
 7470V *Perovskite phase superconductors*
 7470Y *Other superconducting materials*
 7475 Superconducting films
 7490 Other topics in superconductivity
- 7500 MAGNETIC PROPERTIES AND MATERIALS
 7510 General theory and models of magnetic ordering
 7510D *Crystal-field theory and spin Hamiltonians*
 7510H *Ising and other classical spin models*
 7510J *Heisenberg and other quantized localized spin models*
 7510L *Band and itinerant models*
 7510N *Spin-glass models*
 7520 Diamagnetism and paramagnetism
 7520C *Nonmetals*
 7520E *Metals and alloys*
 7520H *Local moment in dilute alloys; Kondo effect, valence fluctuations, heavy fermions*
 7525 Spin arrangements in magnetically ordered materials
 7530 Magnetically ordered materials, other intrinsic properties
 7530C *Saturation moments and magnetic susceptibility*
 7530D *Spin waves*
 7530E *Exchange and superexchange interactions*
 7530F *Spin-density waves*
 7530G *Anisotropy*
 7530H *Magnetic impurity interactions*
 7530K *Magnetic phase boundaries*

- 7530M *Valence fluctuation, Kondo lattice and heavy fermions*
 7530S *Magnetocaloric effect*
 7530T *Surface magnetism*
 7540 Critical-point effects, specific heats, short-range order
 7540C *Static properties*
 7540G *Dynamic properties*
 7540M *Numerical simulation studies*
 7550 Studies of specific magnetic materials
 7550B *Ferromagnetism of Fe and its alloys*
 7550C *Ferromagnetism of other metals*
 7550D *Ferromagnetism of nonmetals*
 7550E *Antiferromagnetics*
 7550G *Ferrimagnetics*
 7550K *Amorphous magnetic materials*
 7550L *Spin glasses*
 7550M *Magnetic liquids*
 7550P *Magnetic semiconductors*
 7550R *Magnetism in interface structures*
 7560 Domain effects, magnetization curves, and hysteresis
 7560C *Domain walls and domain structure*
 7560E *Magnetization curves, hysteresis, Barkhausen and related effects*
 7560G *High coercivity materials*
 7560J *Fine-particle systems*
 7560L *Magnetic aftereffects*
 7560N *Magnetic annealing and temperature-hysteresis effects*
 7570 Magnetic films and multilayers
 7570K *Domain structure (magnetic bubbles)*
 7580 Magnetomechanical and magnetoelectric effects, magnetostriction
 7590 Other topics in magnetic properties and materials
 7600 MAGNETIC RESONANCES AND RELAXATION IN CONDENSED MATTER; MÖSSBAUER EFFECT
 7620 General theory of resonances and relaxation
 7630 Electron paramagnetic resonance and relaxation
 7630D *Ions and impurities: general*
 7630F *Iron group (3d) ions and impurities (Ti-Cu)*
 7630H *Platinum and palladium group (4d and 5d) ions and impurities (Zr-Ag and Hf-Au)*
 7630K *Rare-earth ions and impurities*
 7630L *Other ions and impurities*
 7630M *Colour centres and other defects*
 7630P *Conduction electrons*
 7630R *Free radicals*
 7640 Diamagnetic and cyclotron resonances
 7650 Ferromagnetic, antiferromagnetic, and ferromagnetic resonances; spin wave resonance
 7660 Nuclear magnetic resonance and relaxation
 7660C *Chemical and Knight shifts*
 7660E *Relaxation effects*
 7660G *Quadrupole resonance*
 7660L *Spin echoes*
 7670 Magnetic double resonances and cross effects
 7670D *Electron-nuclear double resonance (ENDOR)*
 7670E *Dynamical nuclear polarization*
 7670F *Double nuclear magnetic resonance (DNMR)*
 7670H *Optical double magnetic resonance (ODMR)*
 7670K *Electron double resonance (ELDOR)*
 7675 Muon spin rotation and relaxation
 7680 Mössbauer effect; other gamma-ray spectroscopy
 7690 Other topics in magnetic resonances and relaxation
 7700 DIELECTRIC PROPERTIES AND MATERIALS
 7720 Permittivity
 7730 Polarization and depolarization effects
 7740 Dielectric loss and relaxation
 7750 Dielectric breakdown and space-charge effects
 7755 Dielectric thin films
 7760 Piezoelectricity and electrostriction
 7770 Pyroelectric and electrocaloric effects
 7780 Ferroelectricity and antiferroelectricity
 7780B *Transitions and Curie point*
 7780D *Domain structure and effects; hysteresis*
 7785 Electrical resonances
 7790 Other topics in dielectric properties and materials
 7800 OPTICAL PROPERTIES AND CONDENSED MATTER SPECTROSCOPY AND OTHER INTERACTIONS OF MATTER WITH PARTICLES AND RADIATION
 7820 Optical properties of bulk materials
 7820B *General theory (for pure homogeneous materials)*
 7820D *Optical constants and parameters*
 7820E *Optical rotatory power*
 7820F *Birefringence*
 7820H *Piezo-, elasto- and acousto-optical effects*
 7820J *Electro-optical effects*
 7820L *Magneto-optical effects*
 7820N *Thermo-optical effects*
 7820W *Other optical properties of bulk materials*
 7830 Infrared and Raman spectra and scattering
 7835 Brillouin and Rayleigh scattering
 7840 Visible and ultraviolet spectra
 7845 Stimulated emission
 7847 Time-resolved optical spectroscopies and other ultrafast optical measurements in condensed matter
 7850 Impurity and defect absorption in solids
 7855 Photoluminescence
 7860 Other luminescence spectra and radiative recombination
 7860F *Electroluminescence*
 7860H *Cathodoluminescence, ionoluminescence*
 7860K *Thermoluminescence*
 7860M *Sonoluminescence, triboluminescence*
 7860P *Chemiluminescence*
 7865 Optical properties of thin films
 7870 Other interactions of matter with particles and radiation
 7870B *Positron annihilation*
 7870C *X-ray scattering*
 7870D *X-ray absorption and absorption edges*
 7870E *X-ray emission threshold and fluorescence*
 7870F *Channelling radiation*
 7870G *Microwave and radio frequency interactions*
 7890 Other topics in optical properties of condensed matter and other interactions of matter with particles and radiation
 7900 ELECTRON AND ION EMISSION BY LIQUIDS AND SOLIDS; IMPACT PHENOMENA
 7920 Impact phenomena
 7920D *Laser-light impact phenomena*
 7920F *Electron impact: Auger emission*
 7920H *Electron impact: secondary emission*
 7940 Thermionic emission
 7960 Photoemission and photoelectron spectra
 7970 Field emission and field ionization
 7975 Exoelectron emission
 7980 Resonance tunnelling
 7990 Other topics in emission and impact phenomena in condensed matter
 8000 CROSS-DISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCE AND TECHNOLOGY
 8100 MATERIALS SCIENCE
 8110 Methods of crystal growth and purification
 8110B *Growth from vapour*
 8110D *Growth from solutions*
 8110F *Growth from melts*
 8110H *Zone melting and zone refining*

- 8110J *Ion plating and other vapour deposition*
 8115 *Methods of thin film deposition*
 8115C *Deposition by sputtering*
 8115G *Vacuum deposition*
 8115H *Chemical vapour deposition*
 8115L *Deposition from liquid phases (melts and solutions)*
 8115N *Growth from solid phases*
 8120 *Other methods of preparation of materials*
 8120E *Powder techniques, compaction and sintering*
 8120G *Specific metals and alloys (compacts, pseudoalloys)*
 8120J *Dispersion-, fibre-, and platelet-reinforced metal-based composites*
 8120L *Ceramics and refractories*
 8120N *Cermets, ceramics and refractory composites*
 8120P *Glasses*
 8120Q *Glass-based composites*
 8120S *Polymers and plastics*
 8120T *Reinforced polymers and polymer-based composites*
 8130 *Phase diagrams and microstructures developed by solidification and solid-solid phase transformations*
 8130B *Phase diagrams of metals and alloys*
 8130D *Phase diagrams of other materials*
 8130F *Solidification*
 8130H *Constant-composition solid-solid phase transformations: polymorphic, massive, and order-disorder*
 8130K *Martensitic transformations*
 8130M *Precipitation*
 8140 *Treatment of materials and its effects on microstructures and properties*
 8140C *Solid solution hardening, precipitation hardening, dispersion hardening*
 8140E *Cold working, work hardening; post-deformation annealing, recovery and recrystallisation; textures*
 8140G *Other heat and thermomechanical treatments*
 8140J *Elasticity and anelasticity*
 8140L *Deformation, plasticity and creep*
 8140N *Fatigue, embrittlement, and fracture*
 8140P *Friction, lubrication, and wear*
 8140R *Electrical and magnetic properties (related to treatment conditions)*
 8140T *Optical properties (related to treatment conditions)*
 8160 *Corrosion, oxidation, etching, and other surface treatments*
 8160B *Metals and alloys*
 8160C *Semiconductors*
 8170 *Materials testing*
 8170C *Nondestructive testing*
 8180 *Reduced gravity experiments*
 8190 *Other topics in materials science*
- 8200 **PHYSICAL CHEMISTRY**
 8220 *Chemical kinetics*
 8220K *Potential energy surfaces for chemical reactions*
 8220M *Nonequilibrium kinetics*
 8220R *Energy distribution and transfer; relaxation*
 8230 *Specific chemical reactions; reaction mechanisms*
 8235 *Polymer reactions and polymerization*
 8240 *Chemical kinetics and reactions: special regimes*
 8240D *Atomic and molecular beam reactions*
 8240T *Chemiluminescence and chemical laser kinetics*
 8245 *Electrochemistry and electrophoresis*
 8250 *Photochemistry and radiation chemistry*
 8250E *Photodissociation, photoionization as studied by luminescence and radiationless transitions*
 8250F *Photolysis and photodissociation by IR, UV, and visible radiation*
 8250G *Radiolysis and dissociation by X-rays and gamma-rays*
 8255 *Radiochemistry*
 8260 *Chemical thermodynamics*
 8265 *Surface processes*
- 8270 *Disperse systems*
 8280 *Chemical analysis and treated physical methods of analysis*
 8280K *Energy conversion spectroscopic methods of analysis*
 8290 *Other topics in physical chemistry*
- 8600 **ENERGY RESEARCH AND ENVIRONMENTAL SCIENCE**
 8610 *Energy resources and their utilisation*
 8610B *Fossil and other fuels*
 8610D *Wind energy*
 8610F *Tidal and flow energy*
 8610H *Geothermal energy*
 8610K *Solar energy*
 8610N *Nuclear energy*
 8610Z *Other topics*
 8630 *Energy conversion*
 8630D *Electrochemical conversion: general*
 8630E *Primary cells*
 8630F *Secondary cells*
 8630G *Fuel cells*
 8630J *Photoelectric conversion; solar cells and arrays*
 8630K *Photoelectrochemical conversion*
 8630L *Electrostatic and magnetohydrodynamic conversion*
 8630M *Thermoelectric conversion*
 8630N *Thermionic conversion*
 8630P *Photosynthesis*
 8630Q *Chemical energy conversion*
 8630R *Thermal energy conversion (heat engines and heat pumps)*
 8630Z *Other topics*
 8640 *Energy storage (secondary energy)*
 8640C *Storage in mechanical energy*
 8640F *Storage in thermal energy*
 8640H *Storage in chemical energy*
 8640K *Hydrogen storage and technology*
 8640Z *Other topics*
 8660 *Requirement for energy: ecological aspects*
 8670 *Environmental science*
 8670C *Soil and rock*
 8670E *Water*
 8670G *Atmosphere*
 8670J *Noise*
 8670L *Measurement techniques and instrumentation*
 8670Z *Other topics*
 8690 *Other topics in energy research and environmental science*
- 8700 **BIOPHYSICS, MEDICAL PHYSICS, AND BIOMEDICAL ENGINEERING**
 8710 *General, theoretical, and mathematical biophysics*
 8715 *Molecular biophysics*
 8715B *Structure, configuration, conformation, and active sites at the biomolecular level*
 8715M *Interactions with radiations at the biomolecular level*
 8716 *Biothermics*
 8720 *Membrane biophysics*
 8725 *Cellular biophysics*
 8725D *Biological transport; cellular and subcellular transmembrane physics*
 8728 *Bioelectricity*
 8730 *Biophysics of neurophysiological processes*
 8730C *Electrical activity*
 8732 *Physiological optics, vision*
 8732C *Anatomy and optics of the eye*
 8732E *Physiology of the eye; nerve structure and function*
 8732L *Light detection; adaptation and discrimination*
 8732N *Colour detection; adaptation and discrimination*
 8732Q *Scales for light and colour detection*
 8732S *Psychophysics of vision, visual perception, binocular vision*

- 8734 Audition
8736 Speech and biocommunications
8738 Mechano- and chemio-ceptions
8740 Biomagnetism
8745 Biomechanics, biorheology, biological fluid dynamics
8750 Biological effects of radiations
8750B *Interactions of biosystems with radiations*
8750C *Bioacoustics (sonic and ultrasonic effects on living matter)*
8750E *Bio-optics (effects of microwaves, light, laser and other electromagnetic waves)*
8750G *Ionizing radiations (UV, X-ray, gamma-ray; particle radiation effects)*
8760 Medical and biomedical uses of fields, radiations, and radioactivity
8760B *Sonic and ultrasonic radiation*
8760D *Electric and magnetic fields (DC and pulsed)*
8760G *Laser beams, microwaves, and other electromagnetic waves*
8760J *Corpuscular radiation and radioisotopes*
8760L *Preparation of radioactive materials for medical and biomedical uses*
8760M *Radiation dosimetry*
8760P *Radiation protection*
8760R *Radioactive pollution*
8765 Aerospace biophysics and medical physics (effects of accelerations, weightlessness and environment)
8770 Biomedical engineering
8770E *Diagnostic methods and instrumentation*
8770G *Patient care and treatment*
8770J *Prosthetics and other practical applications*
8780 Biophysical instrumentation and techniques
8790 Other topics in biophysics, medical physics, and biomedical engineering
- 9000 **GEOPHYSICS, ASTRONOMY AND ASTROPHYSICS**
- 9100 **SOLID EARTH PHYSICS**
9110 Geodesy and gravity
9125 Geomagnetism and geoelectricity
9130 Seismology
9135 Earth interior
9140 Volcanology
9145 Tectonics
9150 Marine geology and geophysics
9160 Physical properties of rocks, minerals and soil
9165 Geophysical aspects of geology and mineralogy
9190 Other topics in solid Earth physics
- 9200 **HYDROSPHERIC AND LOWER ATMOSPHERIC PHYSICS**
9210 Physics of the oceans
9220 Interdisciplinary aspects of oceanography
9240 Hydrology and glaciology
9260 Lower atmosphere
9260S *Climatology*
9265 Atmospheric optics
9290 Other topics in hydrospheric and atmospheric physics
- 9300 **GEOPHYSICAL OBSERVATION, INSTRUMENTATION, AND TECHNIQUES**
9330 Information related to geographical regions
9355 Research organizations and programmes
9365 Data acquisition, processing and storage
9385 Instrumentation and techniques for geophysical, hydrospheric and lower atmosphere research
- 9400 **AERONOMY, SPACE PHYSICS, AND COSMIC RAYS**
9410 Neutral upper atmosphere
- 9410Q *Airglow, nightglow, and geocorona*
9410S *Aurora*
9420 Ionosphere
9430 Magnetosphere
9440 Cosmic rays
9440C *Origin and propagation outside the solar system*
9440E *Interplanetary propagation and effects*
9440H *Energetic solar particles and photons*
9440K *Solar modulation*
9440L *Composition and energy spectra*
9440N *Showers and bursts*
9440R *High-energy interactions, energy > 10 GeV*
9440T *Muons and neutrinos*
9440V *Cosmic ray effects in meteorites and terrestrial, lunar, and planetary matter*
9460 Interplanetary space
9480 Instrumentation and techniques for aeronomy, space physics, and cosmic rays
9490 Other topics in aeronomy, space physics, and cosmic rays
- 9500 **FUNDAMENTAL ASTRONOMY AND ASTROPHYSICS, INSTRUMENTATION AND TECHNIQUES AND ASTRONOMICAL OBSERVATIONS**
9510 Fundamental astronomy
9510C *Celestial mechanics*
9530 Fundamental aspects of astrophysics
9545 Observatories
9555 Astronomical and space-research instrumentation
9575 Astronomical techniques
9580 Astronomical observations
9580D *Radio, radar, and microwave*
9580E *Sub-millimetre*
9580G *Infrared*
9580J *Photographic region*
9580M *Space ultraviolet*
9580N *X-ray*
9580Q *Gamma-ray and cosmic ray*
9580S *Other*
9585 Catalogues, atlases, and finding charts
9590 Other topics in astronomy and astrophysics
- 9600 **SOLAR SYSTEM**
9610 General, solar nebula, and cosmogony
9620 Moon
9630 Planets and satellites
9630D *Mercury*
9630E *Venus*
9630G *Mars and satellites*
9630H *Asteroids*
9630K *Jupiter and satellites*
9630M *Saturn and satellites*
9630P *Uranus and satellites*
9630Q *Neptune and satellites*
9630R *Pluto and satellite*
9630T *Other planets*
9630W *Planetary rings*
9635 Planetary and satellite characteristics and properties
9650 Other objects in the planetary system
9650D *Interplanetary dust*
9650G *Comets*
9650K *Meteors, showers and meteoroids*
9650M *Meteorites, micrometeorites*
9660 Solar physics
9690 Other topics on the solar system
- 9700 **STARS**
9710 Stellar characteristics
9720 Normal stars (by class): general or individual

- | | | | |
|-------|--|-------|--|
| 9730 | Variable and peculiar stars | 9840 | Interstellar medium; nebulae |
| 9760 | Late stages of stellar evolution | 9850 | The Galaxy, extragalactic objects and systems |
| 9760B | <i>Supernovae</i> | 9850K | <i>Groups, clusters, and superclusters</i> |
| 9760G | <i>Pulsars</i> | 9870 | Other sources and radiations |
| 9760J | <i>Neutron stars</i> | 9870D | <i>Radio sources</i> |
| 9760L | <i>Black holes</i> | 9870J | <i>Quasars</i> |
| 9780 | Binary and multiple stars | 9870L | <i>IR sources</i> |
| 9790 | Other topics in stellar astronomy | 9870Q | <i>X-ray sources</i> |
| | | 9870R | <i>gamma-ray sources</i> |
| 9800 | STELLAR SYSTEMS; GALACTIC AND EXTRA- | 9870V | <i>Background radiations</i> |
| | GALACTIC OBJECTS AND SYSTEMS; UNIVERSE | 9880 | Cosmology |
| 9810 | Stellar dynamics | 9890 | Other topics in galactic and extragalactic astronomy |
| 9820 | Stellar clusters and associations | | |

0000 GENERAL

0100 COMMUNICATION, EDUCATION, HISTORY, AND PHILOSOPHY

0110 Announcements, news, and organizational activities

- Statement of Editorial Responsibility for this Issue of the *Canadian Journal of Physics*/Énoncé des responsabilités éditoriales pour ce numéro de la *Revue canadienne de physique*. Betts, D.D. 89
- Introduction from the Editor-in-Chief of Research Journal of the National Research Council of Canada/Introduction du directeur général des Revues scientifiques du Conseil national de recherches du Canada. Dancik, B.P. 181

0175 Science and society

- Comment on the article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* by G.R. Freeman that appeared in the *Canadian Journal of Physics* 68, 794–798 (1990): Extract from a letter to NRC dated March 17, 1992/Commentaire sur l'article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* par G.R. Freeman, article paru dans la *Revue canadienne de physique* 68, 794–798 (1990): Extrait d'une lettre au CNRC datée du 17 mars 1992. Armstrong, P. 183
- Comment on the article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* by G.R. Freeman that appeared in the *Canadian Journal of Physics* 68, 794–798 (1990): Extract from a letter to NRC dated March 17, 1992/Commentaire sur l'article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* par G.R. Freeman, article paru dans la *Revue canadienne de physique* 68, 794–798 (1990): Extrait d'une lettre au CNRC datée du 17 mars 1992. Eichler, M. 186
- Comment on the article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* by G.R. Freeman that appeared in the *Canadian Journal of Physics* 68, 794–798 (1990): Extract from a letter to NRC dated February 11, 1992/Commentaire sur l'article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* par G.R. Freeman, article paru dans la *Revue canadienne de physique* 68, 794–798 (1990): Extrait d'une lettre au CNRC datée du 11 février 1992. Stark-Adamec, C. 191
- Comment on the article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* by G.R. Freeman that appeared in the *Canadian Journal of Physics* 68, 794–798 (1990): Social science and scientific responsibility Stark-Adamec, C., on behalf of The Canadian Psychological Association/Commentaire sur l'article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* par G.R. Freeman, article paru dans la *Revue canadienne de physique* 68, 794–798 (1990): Les sciences sociales et la responsabilité scientifique. Stark-Adamec au nom de la Société canadienne de psychologie. 192
- Comment on the article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* by G.R. Freeman that appeared in the *Canadian Journal of Physics* 68, 794–798 (1990): What the social sciences have to say about maternal labour force participation/Commentaire sur l'article *Kinetics of nonhomogeneous processes in human society: Unethical behaviour and societal chaos* par G.R. Freeman, article paru dans la *Revue canadienne de physique* 68, 794–798 (1990): Les sciences sociales face au travail hors foyer de la mère de famille. Mackie, M. 197

0200 MATHEMATICAL METHODS IN PHYSICS

0220 Group theory

- Note: The vector-ladder operator for the rotational group O_3 . Hardy, J.E. 152

0270 Computational techniques

- On the nature of wire grid modelling for numerical solutions of electromagnetic problems. Yang, X.H., Shafai, L., and Sebak, A.R. 564

0290 Other topics in mathematical methods in physics

- Degenerate trajectories and Hamiltonian envelopes in the method of self-similar approximations. Yukalov, V.I., and Yukalova, E.P. 537

0300 CLASSICAL AND QUANTUM PHYSICS; MECHANICS AND FIELDS

0320 Classical mechanics of discrete systems: general mathematical techniques

- Impulsive forces and the Heisenberg equations of motion for a particle in a box. Atkinson, W.A., and Razavy, M. 380

0350 Classical field theory

- Born-Infeld solution for a point charge in D dimensions. Wolf, C. 484

0365 Quantum theory; quantum mechanics

WKB approximation for the rotating Morse oscillator. Varshni, Y.P.	122
Quasi-bound state calculations for several types of potential in one-, two- and three-dimensional systems, using perturbative techniques. Witwit, M.R.M.	133
<i>Note:</i> The Feynman chessboard in a box. Ord, G.N.	159
Particle interpretation of the Dirac-Coulomb solutions. Guiasu, I., and Koniuk, R.	360
Impulsive forces and the Heisenberg equations of motion for a particle in a box. Atkinson, W.A., and Razavy, M.	380
Hypervirial perturbation calculations for double-well potentials of perturbed oscillator type. Witwit, M.R.M., and Killingbeck, J.P.	475
Degenerate trajectories and Hamiltonian envelopes in the method of self-similar approximations. Yukalov, V.I., and Yukalova, E.P.	537

0500 STATISTICAL PHYSICS AND THERMODYNAMICS**0540 Fluctuation phenomena, random processes, and Brownian motion**

<i>Note:</i> The Feynman chessboard in a box. Ord, G.N.	159
---	-----

1000 THE PHYSICS OF ELEMENTARY PARTICLES AND FIELDS**1100 GENERAL THEORY OF FIELDS AND PARTICLES**

Chiral symmetry-breaking and scaling properties of (2+1)-dimensional QED with four-fermion interactions. Kang, S.K., and Kim, J.K.	398
--	-----

1110 Field theory

<i>Note:</i> The Feynman chessboard in a box. Ord, G.N.	159
An issue in evaluating the damping rate of an energetic fermion in a hot plasma. Baier, R., Nakkagawa, H., and Niégawa, A.	205
Gauge-fixing dependence of gluon and quark-damping rates in hot quantum chromodynamics. Baier, R., Kunstatter, G., and Schiff, D.	208
Effective field theory for plasmas at all temperatures and densities. Braaten, E.	215
Effective actions for Braaten-Pisarski resummation. Brandt, F.T., Frenkel, J., Taylor, J.C., and Wong, S.M.H.	219
Ring-diagram summations in the finite-temperature effective potential. Carrington, M.E.	227
One-loop calculation of the background field quantum-chromodynamic β function. van Eijck, M.A.	237
Thermal bosonic Green functions near zero energy. Evans, T.S.	241
Screening of static quantum-electrodynamic electric fields in hot quantum chromodynamics. Kapusta, J.	248
Damping of fermions in hot gauge theories. Kobes, R., Kunstatter, G., and Mak, K.	252
Transversality of the resummed thermal gluon self-energy. Kunstatter, G.	256
Perturbation theory for nonequilibrium quantum fields. Lawrie, I.D.	262
Gauge (in)dependence of the fermion damping rate in hot gauge theories. Nakkagawa, H., Niégawa, A., and Pire, B.	269
Transition rates of reactions in the microcanonical ensemble and the finite-size effect. Niégawa, A., and Takashiba, K.	276
Medley in finite-temperature field theory. Pisarski, R.D.	280
Self-consistent approximations for field theories at finite temperature. Thoma, M.H.	285
Anomalous damping in Boltzmann plasma. Smilga, A.V.	295
Hard thermal loops and their Noether currents. Weldon, H.A.	300
Radiative corrections in a nonlocal field theory. McKeon, D.G.C.	334
Relativistic three-particle bound states in scalar quantum field theory. Di Leo, L., and Darewych, J.W.	365

1180 Relativistic scattering theory

Hard thermal loops and their Noether currents. Weldon, H.A.	300
---	-----

1200 SPECIFIC THEORIES AND INTERACTION MODELS: PARTICLE SYSTEMATICS

Chiral symmetry-breaking and scaling properties of (2+1)-dimensional QED with four-fermion interactions. Kang, S.K., and Kim, J.K.	398
Magnetostatics of a superconducting quark star. Chakrabarty, S.	488

1220 Models of electromagnetic interaction

<i>Communication:</i> (1/ ω) Noise and the dynamical Casimir effect. Widom, A., Sassaroli, E., and Srivastava, Y.N.	168
Applications of the representation of the Heisenberg-Euler Lagrangian by means of special functions. Valluri, S.R., Lamm, D.R., and Mielniczuk, W.J.	389

1230 Models of weak interactions

<i>Communication:</i> Simple quark mass matrices and mixing. Margolis, B., and Punch, S.	172
--	-----

1235 Composite models of particles

Nonperturbative enhancement of current quark masses and underlying strong-coupling dynamics in QCD. Elias, V.	347
---	-----

1300 SPECIFIC REACTIONS AND PHENOMENOLOGY**1330 Decays of baryons**

- Chiral symmetry-breaking and scaling properties of (2+1)-dimensional QED with four-fermion interactions.
Kang, S.K., and Kim, J.K. 398

1385 Hadron-induced high- and super-high-energy interactions, energy > 10 GeV

- Factorial moments in high-multiplicity events in 800 GeV proton interactions with AgBr nuclei. Shivpuri, R.K., and Verma, V.K. 316

1385H Inelastic scattering, many-particle final state (energy > 10 GeV)

- Factorial moments in high-multiplicity events in 800 GeV proton interactions with AgBr nuclei. Shivpuri, R.K., and Verma, V.K. 316

2000 NUCLEAR PHYSICS**2100 NUCLEAR STRUCTURE****2110 General and average properties of nuclei; properties of nuclear energy levels**

- Magnetic form factors for a trinucleon system using different meson exchange nucleon-nucleon interactions. Osman, A., Zaky, M., and Allam, M.A. 455

2110F Shape, charge, radius, form factors and structure functions

- Note: Nuclear charge density radius parameter and the β decay between mirror nuclei. Ozhasoglu, C., and Rustgi, M.L. 162

2130 Nuclear forces

- Magnetic form factors for a trinucleon system using different meson exchange nucleon-nucleon interactions. Osman, A., Zaky, M., and Allam, M.A. 455

2140 Few-nucleon systems

- Magnetic form factors for a trinucleon system using different meson exchange nucleon-nucleon interactions. Osman, A., Zaky, M., and Allam, M.A. 455

2500 NUCLEAR REACTIONS AND SCATTERING: SPECIFIC REACTIONS**2560 ^3He - and ^4He -induced reactions and scattering**

- Excitation function for α -particle-induced reactions in light-mass nuclei. Singh, N.L., Agarwal, S., and Rama Rao, J. 115

3000 ATOMIC AND MOLECULAR PHYSICS**3100 THEORY OF ATOMS AND MOLECULES****3115 General mathematical and computational developments**

- Particle interpretation of the Dirac-Coulomb solutions. Guiasu, I., and Koniuk, R. 360

3200 ATOMIC SPECTRA AND INTERACTIONS WITH PHOTONS**3220 Atomic spectra grouped by wavelength ranges**

- Beam-laser lifetime measurements for low-lying levels in CrII. Pinnington, E.H., Guo, Q.Ji.B., Berends, R.W., van Hunen, J., and Biémont, E. 470

3250 Fluorescence, phosphorescence; radiationless transitions

- Beam-laser lifetime measurements for low-lying levels in CrII. Pinnington, E.H., Guo, Q.Ji.B., Berends, R.W., van Hunen, J., and Biémont, E. 470

3270 Spectral line shapes and intensities

- Beam-foil lifetimes measured for intercombination transitions in Zn-like and Ga-like ions of Mo. Träbert, E., and Pinnington, E.H. 128

- Beam-laser lifetime measurements for low-lying levels in CrII. Pinnington, E.H., Guo, Q.Ji.B., Berends, R.W., van Hunen, J., and Biémont, E. 470

3280 Photon interactions with atoms

- Electron impact excitation of He 2^1P in the presence of a nonresonant laser field. Wallbank, B., Holmes, J.K., and Weingartshofer, A. 326

- Generation of harmonics treated by a new integral equation method. Varró, S., and Ehlötzky, F. 340

3300 MOLECULAR SPECTRA AND INTERACTIONS WITH PHOTONS

- Comment on: Born-Oppenheimer breakdown in the ground state of carbon monoxide: A direct reduction of spectroscopic line positions to analytical radial Hamiltonian operators. Le Floch, A.C. 175

- Reply to comment on: Born-Oppenheimer breakdown in the ground state of carbon monoxide: A direct reduction of spectroscopic line positions to analytical radial Hamiltonian operators. Coxon, J.A., and Hajigeorgiou, P.G. 177

3310 Calculation of molecular spectra

- WKB approximation for the rotating Morse oscillator. Varshni, Y.P. 122

- Comment on: Born-Oppenheimer breakdown in the ground state of carbon monoxide: A direct reduction of spectroscopic line positions to analytical radial Hamiltonian operators. Le Floch, A.C. 175

3320 Molecular spectra grouped by wavelength ranges	
Electric-field-induced Q branch of the vibrational fundamental of CO. Dagg, I.R., Chanda, A., Gush, H.P., Ho, W.C., and Ozier, I.	91
Charge-induced effects in the spectra of mixtures of solid H_2 , D_2 , and HD. Miller, J.J., Brooks, R.L., and Hunt, J.L.	501
3400 ATOMIC AND MOLECULAR COLLISION PROCESSES AND INTERACTIONS	
3450 Inelastic scattering of atoms and molecules	
CARS (coherent anti-Stokes Raman scattering) investigations of the intermolecular vibrational energy transfer between nitrogen and carbon dioxide molecules. Wang, L., Xu, J.R., and Jones, W.E.	142
A BOXCARS investigation of vibrational relaxation in highly excited 1, 2- <i>trans</i> -dichloroethene. Wang, L., Xu, J.R., and Jones, W.E.	546
3450H Electronic excitation and ionization (inc. beam-foil excitation and ionization)	
Beam-foil lifetimes measured for intercombination transitions in Zn-like and Ga-like ions of Mo. Träbert, E., and Pinnington, E.H.	128
3480 Electron scattering, electron spectra	
Electron impact excitation of He 2^1P in the presence of a nonresonant laser field. Wallbank, B., Holmes, J.K., and Weingartshofer, A.	326
3500 PROPERTIES OF ATOMS AND MOLECULES; INSTRUMENTS AND TECHNIQUES	
3520 Molecules	
Electric-field-induced Q branch of the vibrational fundamental of CO. Dagg, I.R., Chanda, A., Gush, H.P., Ho, W.C., and Ozier, I.	91
3520P Rotation, vibration, and vibration-rotation constants	
<i>Comment on:</i> Born–Oppenheimer breakdown in the ground state of carbon monoxide: A direct reduction of spectroscopic line positions to analytical radial Hamiltonian operators. Le Floch, A.C.	175
<i>Reply to comment on:</i> Born–Oppenheimer breakdown in the ground state of carbon monoxide: A direct reduction of spectroscopic line positions to analytical radial Hamiltonian operators. Coxon, J.A., and Hajigeorgiou, P.G.	177
4000 CLASSICAL AREAS OF PHENOMENOLOGY	
4100 ELECTRICITY AND MAGNETISM; FIELDS AND CHARGED PARTICLES	
4110 Classical electromagnetism	
On the nature of wire grid modelling for numerical solutions of electromagnetic problems. Yang, X.H., Shafai, L., and Sebak, A.R.	564
4190 Other topics in electricity and magnetism	
On the nature of wire grid modelling for numerical solutions of electromagnetic problems. Yang, X.H., Shafai, L., and Sebak, A.R.	564
4200 OPTICS	
New experimental method for determining the $S_1 \rightarrow S_n$ absorption spectrum of highly fluorescent dyes. Gazeau, M.-C., Wintgens, V., Valat, P., Kossanyi, J., Doizi, D., Salvétat, G., and Jaraudias, J.	59
4210 Propagation and transmission in homogeneous media	
Effects of the thickness of substrate on the performance and the design of planar kinoform lenses for axial stigmatism in finite conjugate imaging. Hazra, L.N., Han, Y., and Delisle, C.A.	434
4220 Propagation and transmission in inhomogeneous media	
Tapered optical couplers with grating: Beyond the weak-guidance limit. Florjańczyk, M., and Tremblay, R.	5
4230 Optical information, image formation and analysis	
Optoneural system for invariant pattern recognition. Lejeune, C., and Sheng, Y.	405
Effects of the thickness of substrate on the performance and the design of planar kinoform lenses for axial stigmatism in finite conjugate imaging. Hazra, L.N., Han, Y., and Delisle, C.A.	434
4240 Holography	
Optoneural system for invariant pattern recognition. Lejeune, C., and Sheng, Y.	405
Simple semicontinuous holographic optical elements. Lemelin, G., and Lessard, R.A.	417
4255 Lasing processes	
Analysis of the stability of multiple-phase-shift distributed-feedback semiconductor lasers. Champagne, Y., and McCarthy, N.	29
Influence of phase conjugate optical feedback on the emission properties of visible low-power diode lasers. Mailhot, S., and McCarthy, N.	429
4255R Lasing action in other solids	
Femtosecond pulses from the ultraviolet to the infrared: Optical parametric processes in a new light. van Driel, H.M., and Mak, G.	47

- 4260 Laser systems and laser beam applications**
- A symmetric figure-of-eight optical fiber resonator. Zhang, J.-L., Lit, J.W.Y. 20
- Frequency stabilization of laser resonators using a new temperature-compensated piezo-mirror translator. El-Kashef, H. 25
- 4260F Laser beam modulation, pulsing and switching; mode locking and tuning**
- Pulsed electro-optic modulation for efficient, active continuous-wave laser mode-locking. Flood, C.J., Giuliani, G., and van Driel, H.M. 1
- 4260K Laser beam applications**
- Multiple scattering aerosol lidar inversion method. Bissonnette, L.R., and Hutt, D.L. 39
- 4265 Nonlinear optics**
- Generation of harmonics treated by a new integral equation method. Varró, S., and Ehlötzky, F. 340
- 4265C Stimulated Raman scattering and spectra; CARS; stimulated Brillouin and stimulated Rayleigh scattering and spectra**
- Surface second harmonic susceptibility determined by noncollinear reflected second-harmonic generation. Provencher, P., Côté, C.-Y., and Denariez-Roberge, M.-M. 66
- 4265F Phase conjugation**
- Optical phase conjugation in aqueous rhodamine 6G solutions and in rhodamine 6G embedded in polyvinyl alcohol films. O'Neill, C., Blanchet, V., Denariez-Roberge, M.-M., and Galarnau, P. 442
- 4265K Harmonic generation, frequency conversion, parametric oscillation and amplification**
- Femtosecond pulses from the ultraviolet to the infrared: Optical parametric processes in a new light. van Driel, H.M., and Mak, G. 47
- Surface second harmonic susceptibility determined by noncollinear reflected second-harmonic generation. Provencher, P., Côté, C.-Y., and Denariez-Roberge, M.-M. 66
- 4265P Optical bistability, multistability, and switching**
- Pulse compression, shaping, and pedestal suppression using a nonlinear twin-core fiber in a loop configuration. Essiambre, R.J., and Vallee, R. 11
- 4270 Optical materials**
- Polymer waveguides: characterization through prism-film coupler method. Trepanier, F., Manivannan, G., Changkakoi, R., and Lessard, R.A. 423
- Optical phase conjugation in aqueous rhodamine 6G solutions and in rhodamine 6G embedded in polyvinyl alcohol films. O'Neill, C., Blanchet, V., Denariez-Roberge, M.-M., and Galarnau, P. 442
- 4270G Light-sensitive materials**
- Two-photon excitation and bleaching of the 400 nm luminescence band in germanium-doped-silica optical fibres. LaRochelle, S., Ouellette, F., and Lauzon, J. 79
- Note: Glass sandwich structure for one-step writing of optical waveguides in photopolymers. Carignan, C., Duguay, M.A., Ouellette, F., and Talon, M.-H. 85
- 4278 Optical lens and mirror systems**
- Focusing properties of an axicon pair. Couture, M., and Piché, M. 70
- Effects of the thickness of substrate on the performance and the design of planar kinoform lenses for axial stigmatism in finite conjugate imaging. Hazra, L.N., Han, Y., and Delisle, C.A. 434
- 4280 Optical devices, techniques and applications**
- Effects of the thickness of substrate on the performance and the design of planar kinoform lenses for axial stigmatism in finite conjugate imaging. Hazra, L.N., Han, Y., and Delisle, C.A. 434
- 4280L Optical waveguides and couplers**
- Tapered optical couplers with grating: Beyond the weak-guidance limit. Florjanczyk, M., and Tremblay, R. 5
- Pulse compression, shaping, and pedestal suppression using a nonlinear twin-core fiber in a loop configuration. Essiambre, R.J., and Vallee, R. 11
- Note: Glass sandwich structure for one-step writing of optical waveguides in photopolymers. Carignan, C., Duguay, M.A., Ouellette, F., and Talon, M.-H. 85
- Polymer waveguides: characterization through prism-film coupler method. Trepanier, F., Manivannan, G., Changkakoi, R., and Lessard, R.A. 423
- 4280W Ultrafast optical techniques**
- Femtosecond pulses from the ultraviolet to the infrared: Optical parametric processes in a new light. van Driel, H.M., and Mak, G. 47
- 4281 Fibre optics and fibre waveguides**
- A symmetric figure-of-eight optical fiber resonator. Zhang, J.-L., Lit, J.W.Y. 20
- 4281W Other fibre optical devices and techniques**
- A symmetric figure-of-eight optical fiber resonator. Zhang, J.-L., Lit, J.W.Y. 20
- 4282 Integrated optics**
- Note: Glass sandwich structure for one-step writing of optical waveguides in photopolymers. Carignan, C., Duguay, M.A., Ouellette, F., and Talon, M.-H. 85

4290 Other topics in optics	
New experimental method for determining the $S_1 \rightarrow S_n$ absorption spectrum of highly fluorescent dyes. Gazeau, M.-C., Wintgens, V., Valat, P., Kossanyi, J., Doizi, D., Salvétat, G., and Jaraudias, J.	59
4400 HEAT FLOW, THERMAL AND THERMODYNAMIC PROCESSES	
4410 Heat conduction (models, phenomenological description)	
<i>Comment: Comment on the axial-flow error in the thermal conductivity probe.</i> Hannen, G.E.M.	586
4700 FLUID DYNAMICS	
4720 Hydrodynamic stability and instability	
Generalized hydrodynamics and linear stability analysis of cylindrical Couette flow of a dilute Lennard-Jones fluid. Khayat, R.E., and Eu, B.C.	518
4740 Compressible flows; shock and detonation phenomena	
Generalized hydrodynamics and linear stability analysis of cylindrical Couette flow of a dilute Lennard-Jones fluid. Khayat, R.E., and Eu, B.C.	518
4745 Rarefied gas dynamics	
Generalized hydrodynamics and linear stability analysis of cylindrical Couette flow of a dilute Lennard-Jones fluid. Khayat, R.E., and Eu, B.C.	518
4750 Non-Newtonian dynamics	
Generalized hydrodynamics and linear stability analysis of cylindrical Couette flow of a dilute Lennard-Jones fluid. Khayat, R.E., and Eu, B.C.	518
4765 Magnetohydrodynamics and electrohydrodynamics	
A problem of a viscoelastic magnetohydrodynamic fluctuating-boundary-layer flow past an infinite porous plate. Sherief, H.H., and Ezzat, M.A.	97
5000 FLUIDS, PLASMAS, AND ELECTRIC DISCHARGES	
5200 THE PHYSICS OF PLASMAS AND ELECTRIC DISCHARGES	
5220 Elementary processes in plasma	
Boltzmann-equation analysis of electron swarm parameters in mercury vapour at high values of E/N . Liu, J., and Govinda Raju, G.R.	571
5230 Plasma flow; magnetohydrodynamics	
A problem of a viscoelastic magnetohydrodynamic fluctuating-boundary-layer flow past an infinite porous plate. Sherief, H.H., and Ezzat, M.A.	97
6000 CONDENSED MATTER: STRUCTURE, THERMAL AND MECHANICAL PROPERTIES	
6100 STRUCTURE OF LIQUIDS AND SOLIDS; CRYSTALLOGRAPHY	
Depth profiling of the C/Si interface. Danailov, D.M., Miteva, V., and Littmark, U.	578
6170 Defects in crystals	
Magnetic anisotropy of $\text{Sm}_2\text{Fe}_{17-x}\text{Ga}_x$ hydrides. Dunlap, R.A., and Wang, Z.	574
6700 QUANTUM FLUIDS AND SOLIDS; LIQUID AND SOLID HELIUM	
6780 Solid helium and related quantum crystals	
Charge-induced effects in the spectra of mixtures of solid H_2 , D_2 , and HD. Miller, J.J., Brooks, R.L., and Hunt, J.L.	501
6790 Other topics in quantum fluids and solids (e.g. neutron-star matter)	
<i>Communication: Superfluidité excitonique dans Cu_2O.</i> Mysyrowicz, A. et Fortin, E.	165
6800 SURFACES AND INTERFACES; THIN FILMS AND WHISKERS	
Depth profiling of the C/Si interface. Danailov, D.M., Miteva, V., and Littmark, U.	578
6855 Thin film growth, structure, and epitaxy	
Optimization of the surface morphology of GaAs epitaxial layers grown by close-spaced vapor transport. Huang, Z., Guelton, N., Cossement, D., Guay, D., Saint-Jacques, R.G., and Dodelet, J.P.	462
6890 Other topics in the structure and nonelectronic properties of surfaces and thin films	
Optimization of the surface morphology of GaAs epitaxial layers grown by close-spaced vapor transport. Huang, Z., Guelton, N., Cossement, D., Guay, D., Saint-Jacques, R.G., and Dodelet, J.P.	462

7000 CONDENSED MATTER: ELECTRONIC STRUCTURE, ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES

7100 ELECTRON STATES

7135 Excitons and related phenomena

Communication: Superfluidité excitonique dans Cu₂O. Mysyrowicz, A. et Fortin, E. 165

7138 Polarons and electron-phonon interactions

Bound polaron in a narrow-band polar crystal. Lépine, Y., and Schönborn, O. 493

7155 Impurity and defect levels

Bound polaron in a narrow-band polar crystal. Lépine, Y., and Schönborn, O. 493

7200 ELECTRONIC TRANSPORT IN CONDENSED MATTER

7220 Conductivity phenomena in semiconductors and insulators

1/f Noise from levels in a linear or planar array: Dislocations in metals. Morrison, S.R. 147

The effect of H on a-SiN_x prepared by ion-beam-assisted reaction deposition. Zhang, S., and Brodie, D.E. 448

7220F Low-field transport and mobility; piezoresistance

The low-field Hall mobility of an amorphous Hubbard model. Liu, K.L. 351

7220M Galvanomagnetic and other magnetotransport effects

The low-field Hall mobility of an amorphous Hubbard model. Liu, K.L. 351

7280 Conductivity of specific semiconductors and insulators

The effect of H on a-SiN_x prepared by ion-beam-assisted reaction deposition. Zhang, S., and Brodie, D.E. 448

7300 ELECTRONIC STRUCTURE AND ELECTRICAL PROPERTIES OF SURFACES, INTERFACES, AND THIN FILMS

7320 Electronic surface states

Studies on carrier lifetime in heavily doped InGaAsP. De., S.S., Ghosh, A.K., Bera, M., Hazra, A.K., and Haldar, J.C. 582

7340 Interfaces

Studies on carrier lifetime in heavily doped InGaAsP. De., S.S., Ghosh, A.K., Bera, M., Hazra, A.K., and Haldar, J.C. 582

7360 Electronic properties of thin films

The effect of H on a-SiN_x prepared by ion-beam-assisted reaction deposition. Zhang, S., and Brodie, D.E. 448

7400 SUPERCONDUCTIVITY

7440 Fluctuations and critical effects

Magnetostatics of a superconducting quark star. Chakrabarty, S. 488

7500 MAGNETIC PROPERTIES AND MATERIALS

7530 Magnetically ordered materials, other intrinsic properties

Magnetic anisotropy of Sm₂Fe_{17-x}Ga_x hydrides. Dunlap, R.A., and Wang, Z. 574

7700 DIELECTRIC PROPERTIES AND MATERIALS

7760 Piezoelectricity and electrostriction

Relaxation behaviour of Pb (Ni_{1/3}Nb_{2/3})O₃ ceramics. Sharma, S., Sati, R., and Choudhary, R.N.P. 322

7780 Ferroelectricity and antiferroelectricity

Relaxation behaviour of Pb (Ni_{1/3}Nb_{2/3})O₃ ceramics. Sharma, S., Sati, R., and Choudhary, R.N.P. 322

7800 OPTICAL PROPERTIES AND CONDENSED MATTER SPECTROSCOPY AND OTHER INTERACTIONS OF MATTER WITH PARTICLES AND RADIATION

Absorption and index of refraction for the modeling of InGaAsP/InP photonic devices. Reid, B., Maciejko, R., and Champagne, A. 410

7820 Optical properties of bulk materials

Photoelectronic properties of YBa₂Cu₃O₆. Ullrich, B., Kulaç, I., and Pint, H. 512

7830 Infrared and Raman spectra and scattering

Charge-induced effects in the spectra of mixtures of solid H₂, D₂, and HD. Miller, J.J., Brooks, R.L., and Hunt, J.L. 501

7900 ELECTRON AND ION EMISSION BY LIQUIDS AND SOLIDS; IMPACT PHENOMENA

7920 Impact phenomena

Note: Sputtering of cobalt and chromium by argon and xenon ions near the threshold energy region. Handoo, A.K., and Ray, P.K. 155

8000 CROSS-DISCIPLINARY PHYSICS AND RELATED AREAS OF SCIENCE AND TECHNOLOGY

8100 MATERIALS SCIENCE

Depth profiling of the C/Si interface. Danailov, D.M., Miteva, V., and Littmark, U. 578

8115 Methods of thin film deposition

Depth profiling of the C/Si interface. Danailov, D.M., Miteva, V., and Littmark, U. 578

8115G Vacuum deposition

Élimination des hydrures métalliques des déchets gazeux d'un réacteur LP-MOVPE pour la croissance de composés (In, Ga)(As, P). Cova, P., Masut, R.A., Lacoursière, R., Bensaada, A., Tran, C.A., et Currie, J.F. 307

8120 Other methods of preparation of materials

Relaxation behaviour of $\text{Pb}(\text{Ni}_{1/3}\text{Nb}_{2/3})\text{O}_3$ ceramics. Sharma, S., Sati, R., and Choudhary, R.N.P. 322

8200 PHYSICAL CHEMISTRY

8230 Specific chemical reactions; reaction mechanisms

Élimination des hydrures métalliques des déchets gazeux d'un réacteur LP-MOVPE pour la croissance de composés (In, Ga)(As,P). Cova, P., Masut, R.A., Lacoursière, R., Bensaada, A., Tran, C.A., et Currie, J.F. 307

9000 GEOPHYSICS, ASTRONOMY, AND ASTROPHYSICS

9100 SOLID EARTH PHYSICS

9125 Geomagnetism and geoelectricity

Magnetostatics of a superconducting quark star. Chakrabarty, S. 488

9400 AERONOMY, SPACE PHYSICS, AND COSMIC RAYS

Mise au point d'une méthode de détermination de la température moyenne de la mésosphère à partir de la mesure de la vitesse de phase des ondes longues sur un trajet grande distance. Ayachi, M. 106

9410 Neutral upper atmosphere

Satellite airglow limb tomography: Methods for recovering structured emission rates in the mesospheric airglow layer. McDade, I.C., and Llewellyn, E.J. 552

9490 Other topics in aeronomy, space physics, and cosmic rays

Mise au point d'une méthode de détermination de la température moyenne de la mésosphère à partir de la mesure de la vitesse de phase des ondes longues sur un trajet grande distance. Ayachi, M. 106

9700 STARS

9730 Variable and peculiar stars

Magnetostatics of a superconducting quark star. Chakrabarty, S. 488

9800 STELLAR SYSTEMS; GALACTIC AND EXTRAGALACTIC OBJECTS AND SYSTEMS; UNIVERSE

9840 Interstellar medium; nebulae

Erratum: Statistical nature of astrophysical maser radiation for linear masers. Wu, Y.C. 403

